

Rediscovery of *Amanipodagrion gilliesi*, with notes on habitat, behaviour and conservation (Odonata: Megapodagrionidae)

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Abstract

Amanipodagrion gilliesi was known previously only from four males collected in 1959 and 1962 in the Usambara Mountains, south-east Tanzania. Recently it has been rediscovered at two shady streams in that area. The species is not living in swamps, as previously stated, but is apparently restricted to a small area in the Amani-Sigi Forest. Data on its ecology, behaviour and reproductive habitat are presented for the first time.

Introduction

Amanipodagrion gilliesi was described by Pinhey (1962) from two males collected by M.T. Gillies in the East Usambara Mountains in 1959 (Table 1). In the Natural History Museum, London, two additional males are deposited, which were collected from the same or a nearby locality by Gillies in 1962. These additional museum specimens have never been mentioned in relevant literature, either by Pinhey (1982: 2), or by Samways (2002: 154).

To my knowledge these four males are the only specimens in museum collections, and no additional observations in the field have been made since then. Unfortunately no data concerning the exact collection locality are available (Table 1). In the type description no information other than "Amani in the East Usambara Mountains" is given by Pinhey (1962: 22). Later the same author gives more detailed information, but the source of this remains unclear: "*Amanipodagrion gilliesi* is only known from the type series of males, all from a swampy area on the East Usambara mountains below Amani. No further records are known to me and I have heard that much of the original forest and swamp vegetation have been cleared for more tea plantations since Dr. Gillies captured the males" (Pinhey 1982: 2). This misleading habitat description has been adapted by Stuart et al. (1990: 210): "The dragonfly *Amanipodagrion gilliesi* is only known from swamps near Amani in the East Usambara Mountains" and by Samways (2002: 154) "Swamp associated with forest".

In 2001 and 2002 I found a population of *A. gilliesi* along a small stream and obtained information on the species' ecology, behaviour and reproductive habitat.

The East Usambara Mountains belong to a chain of forested mountains of ancient origin: Udzungwa, Uluguru and Usambara Mountains in eastern Tanzania and Taita Hills in southeast Kenya (Griffiths 1993), and are called the "Eastern Arc Mountains". Today these mountains are highly fragmented 'islands' in an otherwise dry environment.

Rediscovery of the species

Habitat

I found *Amanipodagrion gilliesi* at a stream in the Sigi Valley, East Usambara Mountains, Tanzania. The stream (425 m a.s.l.; 05°05'56.9"S, 38°39'47.4"E) arised in the Sigi Forest and joined the Sigi River (stream I in Table 1) after ca 500 m. The forest stream was permanent, fast-running and clear, featuring large boulders, many rapids and small waterfalls. Except for some tree fall gaps the flanking canopy was closed. The stream bed was rocky, sand and detritus being found only in some areas where the current was slower (Fig. 1).

Observations

During a short visit to the stream I in 2001 (Table 1) I found a freshly emerged female of *A. gilliesi* sitting on a twig about 50 cm above the water surface. Emergence must have occurred during late morning. Unfortunately I could not find the exuvia. On that occasion, despite intensive searching along the stream and in the surrounding forest I found no other specimens. During subsequent visits in 2002 I found many males and females at the same stream (Table 1). In September 2002 I found no adults at the same site, despite searching intensively.

I found only one male at another locality (stream II in Table 1; 406 m a.s.l.; 05°05'56.5"S, 38°39'46.4"E), although I searched several similar habitats. I encountered no individuals at streams in the Kamkworo Forest (> 1,000 m a.s.l.), in and around the Amani Medical Research Centre (ca 850 m a.s.l.) and in the Lunguza Forest (ca 150 m a.s.l.).

Behaviour

The males were found only in deeply shaded parts beside the stream usually under dense vegetation or overhanging boulders close to small rivulets. They perched with their wings spread laterally and in a vertical 'hanging' position (Fig. 2). They seldom moved and then flew only very short distances, either to approach another male or (more often) to hunt small insects. Immediately after flight males often performed 'wing clapping' (as defined by Corbet 1999: 290), whether or not conspecifics were close by.

I observed males from sunrise (06:30 h solar time) until sunset (18:40 h solar time) at the same sites along the stream, regardless of the weather.



Figure 1. Habitat of *Amanipodagrion gilliesi*, clear and shady stream with boulders.

Table 1. Previously collected specimens and individuals observed by the author of *Amanipodagrion gilliesi*. BMNH: Natural History Museum, London; NMBZ: National Museum, Bulawayo, Zimbabwe; VC: V. Clausnitzer private collection.

Date	Sex	Locality	alt. [m]	leg.	coll.
v 1959*	♂	"Amani"	?	M.T. Gillies	NMBZ
v 1959**	♂	"Amani"	?	M.T. Gillies	BMNH
10 ii 1962	♂	"Amani, Sigi Valley"	?	M.T. Gillies	BMNH
10 ii 1962	♂	"Amani, Sigi Valley"	762***	M.T. Gillies	BMNH
24 x 2001	♀	stream I, Sigi Valley	425	V. Clausnitzer	VC
27 iii 2002	> 25 ♂, 5 ♀	stream I, Sigi Valley	425	V. Clausnitzer	VC
30 iii 2002	1 ♂	stream II, Sigi Valley	406	V. Clausnitzer	-
2 v 2002	> 10 ♂	stream I, Sigi Valley	425	V. Clausnitzer	-

* holotype

** paratype

*** 2,500 feet originally given on the label

In March 2002 I found five females in the vicinity of the stream and witnessed one unsuccessful mating attempt, but no oviposition behaviour.

Co-existing dragonfly species

Species observed along the above-mentioned stream I in the Sigi Forest were: *Umma declivium* Förster, territorial males; *Platycypha auripes* (Förster), territorial males; *Chlorocnemis abbotti* (Calvert), ovipositing tandems; *Nepogomphoides stuhlmanni* Schouteden, territorial males and one emerging female. In the surrounding forest *Coryphagrion grandis* Morton and *Hadrothemis scabrifrons* Ris were reproducing in phytotelmata.

Discussion

Habitat

Adults of *Amanipodagrion gilliesi* were encountered only along deeply shaded, fast running streams. I therefore regard previous habitat descriptions as incorrect. The locality "Amani" from the first four males collected (Table 1) can mean anything from the Medical Research Center in 853 m a.s.l. to any other locality in the Amani-Sigi Forest ranging between 400 to 1,500 m a.s.l. The label "Sigi Valley" indicates that these specimens must have been collected below the Amani Medical Research Centre somewhere in the Sigi Valley, although the altitude given for one of the males corresponds to that of the



Figure 2. Perching male of *Amanipodagrion gilliesi*, East Usambara Mountains, 27 March 2002.

Amani Medical Research Centre. The habitat information “swampy area” (Pinhey 1982: 2) must be incorrect, because *A. gilliesi* is known to be a stream species. Additionally, swampy areas do not occur naturally at altitudes between 200 and 1,500 m a.s.l. in the East Usambara Mountains. I found only one swampy area in the Amani Nature Reserve: an impounded stream close to the Amani Medical Research Centre called “Amani Pond”. A dragonfly survey in this swampy area revealed a number of species, but neither *A. gilliesi* nor any other dragonfly species typical of the Eastern Arc Mountains. I assume that the previously collected specimens were obtained from habitats similar to those described in this paper and that the information about the precise locality is incorrect. It is likely that the specimens were collected where I found *A. gilliesi* or nearby.

Distribution

With one exception, my efforts to find more localities with *A. gilliesi* failed, although I checked a number of similar streams in March and May 2002. If present, this species cannot be overlooked: it stays at water the whole day, even if disturbed, and, with its banded wings and white tipped abdomen, is easily detected. Only at another small stream in the Sigi Valley at 406 m a.s.l. I found one *A. gilliesi* male. This stream was shaded by dense gallery forest, but surrounded by cultivated land, and even directly along the stream the forest had already been opened up in some areas. Despite an intensive searching effort only one male was found whereas there were many individuals at stream I (Table 1) at the same time. I assume that this solitary male was a remnant of a once larger population, because stream I and II were too close to each other (Table 1) and too similar in their general physical conditions to be regarded as discrete habitats.

One factor to be reckoned with, and which is prevalent all over East Africa is the almost complete destruction of low-altitude forests. In the coastal area most forest areas between 400 and 100 m a.s.l. have been converted to agricultural land, especially plantations. Higher altitudes usually feature less diverse wetland habitats, often have very limited water resources and are much cooler. If *A. gilliesi* is indeed absent from higher altitudes of the Usambara Mountains, this may represent a temperature limitation. The mean temperature drops from 25°C at 400 m a.s.l. to 20°C at 900 m a.s.l., which is an unusually abrupt temperature decline for tropical Africa (Hamilton 1989).

As already stated, *A. gilliesi* is unlikely to be overlooked if present and if surveys are conducted at the right time, that is from December to May. A number of species which are much more difficult to find have been recorded from other localities in the Usambara Mountains and from other Eastern Arc Mountains, e.g. *Nepogomphoides stuhlmanni*, *Chlorocnemis abbotti* or *Coryphagrion grandis*. Unlike many other taxa, dragonflies do not feature endemics of a single mountain chain of the Eastern Arc Mountains, but are usually Eastern Arc endemics, with a distribution range from Malawi to northern Tanzania, some even to southern Kenya. *A. gilliesi* is the only exception, being restricted to the East Usambara Mountains.

From mainland Africa only two other representatives of the Megapodagrionidae are known: *Nesolestes nigeriensis* Gambles from Nigeria and Cameroon and *Neurolestes trinervis* Selys from Cameroon and Gabun. On Madagascar the Megapodagrionidae are represented by 34 species and four genera. All species from mainland Africa occur in forests, which have been forest refugia during dry geological periods (e.g. Kingdon 1989). These continental Megapodagrionidae are likely to be relicts of a once wider distribution range of this family.

Behaviour

Whether the observed wing clapping in male *A. gilliesi* was a territorial declaration or had a ventilatory or thermoregulatory function I do not know. In the latter case, it could only serve as endogenous cooling, since wing clapping was not correlated with the hottest time of the day and animals never perched exposed directly to the sun.

Although I did not find specimens at night, I assume that they spend the night beside the stream. Remaining at water the whole day, even if it is raining or overcast, is very unusual for forest dragonflies, which normally repair to the tree canopies when it gets cloudy (e.g. Clausnitzer 1998).

Based on my observations I assume that this species is seasonal and that emergence occurs in October and November, and that the main reproduction season is between December and April. In May the number of males beside the stream was already less than in April.

Conservation

A. gilliesi evidently has a very limited distribution range. It seems to be restricted to the Amani-Sigi Forest in the East Usambara Mountains, where only one viable population is presently known from a stream about 500 m long. This stream is in a forest reserve within the East Usambara Conservation Area and is currently not under threat.

Effort is necessary to survey the area of the East Usambara Mountains for more populations. If *A. gilliesi* remains a local endemic of the Amani-Sigi Forest it would be very interesting to study its biogeography with regard to its evolutionary history, origin and closest relatives. Such a localized distribution is very unusual in dragonflies of Eastern Africa, where most species have a wide range or a disjunct distribution as a result of habitat degradation and habitat change.

To summarize our present knowledge, Pinhey's statement "I suspect it is an endangered species" (Pinhey 1982: 2) should become "it is a highly endangered species".

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